

Prevalence of different types of healthcare-associated infections in a military hospital in Al Saih

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ABSTRACT

Aim: The objective of the current study was to explore prevalence of different types of healthcare-associated infections (HAIs) in a military hospital in Al-Saih city. **Methodology:** Infection control unit in the hospital helped us in collecting the required data about healthcare-associated infections. **Results:** The average rate of healthcare associated infections in 2020 was 0.11%. The rate of device-associated infection was low. For example, the rate of central line associated bloodstream infections was 0.84 per 1000 central line days, and the rate of catheter associated urinary tract infections was 0.50 per urinary catheter days. Moreover, the rate of other healthcare associated infections was also low. For example, the rate of surgical site infection was 0.04%. **Conclusion:** In order to understand the trends of HAIs, more studies are required. Moreover, more efforts are required by health care workers and other stakeholders to reduce the occurrence of HAIs.

Keywords: Healthcare-associated infections, hospital acquired infections, nosocomial infections, prevalence

1. INTRODUCTION

The term “healthcare associated infection (HAI)” has replaced the terms “hospital-acquired infection” or “nosocomial infection”, for its occurrences as a result of several complications following surgical procedures, medical devices such as ventilators and catheters, and transmission between patients and healthcare professionals (Reghu et al., 2014; Horan et al., 2008). Healthcare associated infection is defined as a systemic or localized infection occurring for the patients in different hospitals during the process of care that was not present or incubating at admission time. Most of these infections become evident at 48 hours or more after admission (Shahida et al., 2016; Bereket, 2012).

HAIs are caused by bacterial, fungal, and viral microorganisms; the most common infections are pneumonia such as ventilator-associated pneumonia (VAP), bloodstream infection (BSIs), surgical site infection (SSI), and urinary tract infection (UTI) (Medscape, 2016). These infections happen in long term care facilities, hospitals, ambulatory surgical centers, dialysis centers, nursing homes, in addition to other healthcare facilities (Clevelandclinic, 2021; Vu & Le, 2020a; Vu & Le, 2020b; Altowijri et al. 2020). The factors that increase the



risk of an HAI include use of catheter or ventilator, surgery, injections, the occurrence of disease that spreads between healthcare worker to patient or patient to patient, and the use of facilities or equipment that are not appropriately cleaned and disinfected (Clevelandclinic, 2021).

HAIs are associated with increased mortality and morbidity rates, excess health costs, increased resistance to antimicrobials, and increased length of stay (Magill et al., 2014; Yokoe et al., 2014). The prevalence of these infections is high; Allegranzi et al., (2011) reported that HAIs are a worldwide problem affecting the clinical outcome of about 15% of the hospitalized patients globally. Moreover, several studies from the United States, Singapore, and Europe showed that the point-prevalence of HAI ranged from 3.2–11.9% (Magill et al., 2014; Magill et al., 2018; Cai et al., 2017; Suetens et al., 2018).

World Health Organization strongly recommends national surveillance of HAI with timely data feedback and benchmarking capacity as one of the main components of infection prevention and control required to decrease the rate of HAIs and antimicrobial resistance transmission (WHO, 2016). The objective of the current study was to explore prevalence of different types of healthcare-associated infections in amilitary hospital in Al-Saih city.

2. METHODOLOGY

Study setting

This study was conducted in amilitary Hospitalin Al-Saih city to explore prevalence of different types of healthcare-associated infections. Al-Saih is one of the main cities in Saudi Arabia, with a population of more than 376 thousand people. The military hospitalin Al-Saih provides health services to about 200 thousand persons yearly (Asiri et al., 2019).

Inclusion/exclusion criteria

We included all patientswho had one of the HAIs during 2020. So, other types of infections and the HAIs before 2020 were excluded.

Data collection and analysis

Infection control unit in the hospital help us in collecting the required data about healthcare-associated infections after the approval of the study by the hospital IRB committee with a No: 4101728. The collected data included the overall rate of healthcare associated infections, device-associated infection rates, and the rate of other healthcare associated infections. The data were collected using Microsoft Excel and descriptive data of the study were represented by percentages and frequencies. The percentages were calculated by dividing the number of each category by the total number, and then multiplying the result by 100%. The mean and the standard deviation of different healthcare associated infections were calculated by Excel descriptive data analysis option.

3. RESULTS

The lowest rate of healthcare associated infections was in the first third of 2020 (0.04%) and the highest rate was in the last third of 2020 (0.19%). The average rate of HAIs in 2020 was 0.11% (8 infections out of the 7539 admissions). The rate of healthcare associated infections is shown in figure 1.

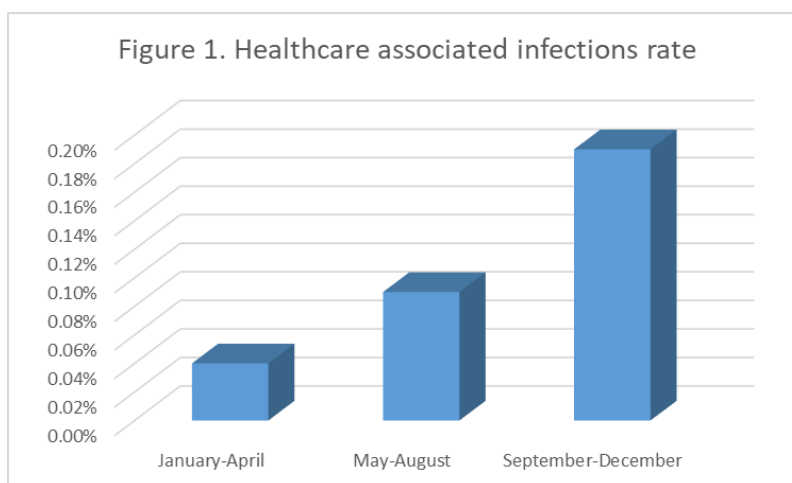


Table 1 shows the rates of device-associated infection in 2020. The rate of central line associated bloodstream infections was 0.84 per thousand central line days, the rate of catheter associated urinary tract infections was 0.50 per urinary catheter days, and the rate of ventilator associated pneumonia was 0 per thousand ventilator days. Table 2 shows the rates of other healthcare associated infections. The rate of surgical site infection was 0.04% in 2020. The rate of clostridium difficile infection was 0 per thousand patient days, and the rate of infections that were caused by multi-drug resistant organisms was 1.95 per thousand patient days.

Table 1 Device-associated infection rates

Months	Device Days	Numberof Infections	Infection Rate
Central Line Associated Bloodstream Infections (CLABSI)			
January-April	763	0	0 per 1000 central line days
May-August	728	0	0 per 1000 central line days
September-December	887	2	2.25 per 1000 central line days
CatheterAssociated Urinary Tract Infections (CAUTI)			
January-April	3764	1	0.27 per urinary catheter days
May-August	3057	2	0.65 per urinary catheter days
September-December	3225	2	0.62 per urinary catheter days
Ventilator Associated Pneumonia (VAP)			
January-April	1297	0	0 per 1000 ventilator days
May-August	1126	0	0 per 1000 ventilator days
September-December	1390	0	0 per 1000 ventilator days

Table 2 The rate of other healthcare associated infections.

Surgical Site Infection Rate			
Months	Total number of surgery cases	Number of SSI cases	% of SSI rate
January-April	811	0	0.00%
May-August	681	0	0.00%
September-December	899	1	0.11%
Clostridium DifficileInfection (CDI) Rate			
Months	Number of patient Days	Number of CDI cases	CDI rate per 1000 patient days
January-April	13312	0	0 per 1000 patient days
May-August	11773	0	0 per 1000 patient days
September-December	12793	0	0 per 1000 patient days
Multi-Drug Resistant Organisms (MDRO)Infections Rate			
Months	Number of patient days	Numberof MDROcases	MDRO rate per 1000patient days
January-April	13312	28	2.10 per 1000 patient days
May-August	11773	24	2.04 per 1000 patient days
September-December	12793	22	1.72 per 1000 patient days

The mean and the standard deviation of different healthcare associated infections were calculated by Excel descriptive data analysis option. Table 3 shows the mean and the standard deviation values for different healthcare associated infections rates.

Table 3 The mean of different healthcare associated infections.

Variable	Mean	Standard Deviation
Overall healthcare associated infections rate.	0.11%	0.000763763
Central Line Associated Bloodstream Infections rate	0.75 per 1000 central line days	1.299038

Catheter Associated Urinary Tract Infections rate	0.513333 per urinary catheter days	0.211266
Ventilator Associated Pneumonia rate	0.00 per 1000 ventilator days	0.00
Surgical Site Infection Rate	0.04%	0.06350853
Clostridium Difficile Infection Rate	0.00 per 1000 patient days	0.00
Multi-Drug Resistant Organisms Infections Rate	1.953333per 1000 patient days	0.204287

4. DISCUSSION

The average rate of HAIs in 2020 was low (0.11%). This low rate could be due to several practices including the adherence to the recommendations of infection control procedures and policies, the correct and frequent hand hygiene measures, keeping a clean healthcare environment and clean equipment, using antibiotics correctly, and complying with standard sterile techniques. Russo et al reported that the prevalence of HAIs was 9.9% (Russo et al., 2019). A previous study that was conducted in a Norwegian health region found that the overall rate of HAIs was 6.5% (Andersen et al., 2000). Moreover, Mühlemann et al., (2004) stated that the prevalence of HAIs in Swiss children's hospitals ranged from 1.4% to 11.8%. WHO stated that in developed countries, that the rate of HAIs is 7% and that the rate of HAIs is 10% in developing countries (WHO, 2013).

In this study, the rate of central line-associated bloodstream infections was 0.84 per thousand central line days, the rate of catheter-associated urinary tract infections was 0.50 per urinary catheter days and the rate of ventilator-associated pneumonia was 0 per thousand ventilator days. Zhang et al., (2019) reported that the adjusted five-year HAI incidence rate decreased from 4.10 per thousand patient days in 2013 to 3.62 per thousand patient days in 2017. They also stated that the most commonly HAIs were respiratory tract infection (43.80%), bloodstream infections (15.74%), and urinary tract infection (12.69%) (Zhang et al., 2019^a). Stewart et al., (2021) stated that the incidence of HAI was 250 infections per 100,000 bed days and that the rates of urinary tract infections, bloodstream infections, and lower respiratory tract infection were 51.2, 44.7, and 42.2 per 100,000 acute occupied bed-days, respectively (Stewart et al., 2021). Zhang et al., (2019^b) reported that the rate of HAIs is 1.24% and that the rates of ventilator-associated pneumonia, catheter-associated urinary tract infection, and central line-associated bloodstream infection were 7.92 per thousand ventilator days, 2.06 per thousand catheter-days, and 0.63 per thousand central line-days, respectively.

In the present study, the rate of surgical site infection was 0.04% in 2020. The rate of clostridium difficile infection was 0 per thousand patient days. Moreover, the rate of infections that were caused by multi-drug resistant organisms was 1.95 per thousand patient days. Forrester et al., (2021) informed that among HAIs in the United States, infection with *Clostridioides difficile* infection represent 56% of HAIs, surgical site infection 31%, catheter- and line-associated blood stream infection 7%, catheter-associated urinary tract infection 4%, and ventilator-associated pneumonia 3%. The HAIs rate in the present study was less than the rate in Saudi Arabia. Mutair et al., (2021) informed that at a multi-hospital healthcare system in Saudi Arabia, 29 393 pathogens caused 17 539 HAIs in 15 259 patients. Alshamrani et al., (2019) stated that at several tertiary hospitals in Saudi Arabia, the HAIs prevalence was 6.8% and that the most common infection was pneumonia (27.2%), followed by UTIs (20.2%), and BSIs (10.5%). They also reported that approximately 19.2% of healthcare-associated infections were device associated (Alshamrani et al., 2019). Gaid et al., (2018) stated that among 6178 ICU patients, 13,492 developed device-associated nosocomial infections during 2013–2016 and in contrast to the results of the present study they reported that ventilator-associated pneumonia was the most common device-associated nosocomial infections (57.4%), followed by catheter-associated urinary tract infection (28.4%), and central line-associated bloodstream infection (14.2%).

5. CONCLUSION

Healthcare associated infections prevalence was low in 2020. Further studies are required to understand the trends (incidence, distribution, and prevalence) of HAIs. Efforts are required by health care providers and other stakeholders to prevent HAIs occurrence.

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Author Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Ethical approval

The study was approved by the military hospital IRB committee with a No: 4101728.

Conflicts of interest

The authors declare that they have no conflict of interest.

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Data and materials availability

All data associated with this study are present in the paper.

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